LG Barnes
file copy

November 21, 1980

Mr. Robert Dowlen
Woodward, Clyde & Associates
3467 Kurtz Street
San Diego, California 92110

Dear Mr. Dowlen:

Tom Deméré at the San Diego Museum mentioned that you are preparing a geologic guidebook for the Oceanside area for next year, and suggested that I contact you on the possibility of submitting a manuscript on the fossil vertebrates from the San Mateo Formation. Tom was aware of the work done by my associates and myself at the Los Angeles Museum and at Berkeley on this fauna.

I could offer a manuscript authored by myself, Dr. Hildegarde Howard, Chief Curator Emeritus at this Museum, and Dr. J. Howard Hutchison, Museum Scientist at U.C. Berkeley's Museum of Paleontology. It could be about 15 to 20 published pages and include more illustrations and be more comprehensive than the paper on whales from the San Diego Formation that I did for your 1973 San Diego guidebook. We could report on the sharks, fishes, terrestrial and marine birds, terrestrial mammals, pinnipeds, whales and sea cows and could place them in stratigraphic perspective and comment on the down thrown section of San Mateo Formation adjacent to the San Onofre Breccia and on the rather surprising 10 m.y.a. to 5 m.y.a. time span indicated by fossils in the San Mateo Formation.

If this proposal interests you, I would appreciate hearing from you and learning of submittal dates and format.

Sincerely,

Lawrence G. Barnes
Curator
Vertebrate Paleontology

LGB:lh

Dr. Howard.

The vertebrate fauna of the marine Pliocene San Mateo Formation in Southern California.

by

Lawrence G. Barnes – Pinnipeds & Cetacea

J. Howard Hutchison – Terrestrial mammals, salmon

Hildegarde Howard birds

and

Camm C. Swift fishes

Rec'd July 12, 1972

Dr. Howard,
I am going to Oceanside
Wednesday, July 12, and will
make notes on the geology.
Larry

On June 13, 1969 the Los Angeles County Museum of Natural History Foundation renewed excavations at the Rancho La Brea tar pits, following a lapse of 55 years. Meticulous excavation, steel girder pit support, and advanced cleaning techniques are being used to uncover scientific information overlooked or ignored by the original digging parties.

One of the most rewarding aspects of the operation is the enthusiastic support given the project by local people and corporations. Initially, funds were furnished by the Foundation of the Natural History Museum, but without subsequent gifts of time, money, and materials from a generous and interested public, this important scientific undertaking could not have reached its present status. Donations range from the 25-cent piece with which a young visitor "feeds the Kitty" to the temporary Haida Hide building now housing the laboratory; tools, from dental picks to the loan of huge cranes and drills; time, given by excavators, preparators, secretaries, and guides already amounts to over 32,177 hours. The "dig" has drawn the assistance of people from all walks of life.

National Science Foundation money has recently been granted, to supplement private funds, but without the whole-hearted support of so many, this major scientific undertaking could not have been started and cannot continue to its ultimate goal.

Major donors of time, materials, and money are listed on the following pages. Our sincere thanks are expressed to them all, as well as to everyone else who has so generously contributed to the success of the new Rancho La Brea excavations.

In: Rocks & Minerals — Frazier 1970
Title Fossil Rept. from Oceanside (popular article)

Introduction

~~SAN MATEO FORMATION~~

The name San Mateo Formation was first used by Woodford (1925, p. 217) in his article on the San Onofre Breccia. Very little mention was made of the San Mateo Formation which Woodford grouped among "Post-Capistrano Formations", and described as tilted arkosic sands, gravels, shists with rare fossils. Woodford indicated that the formation was doubtfully correlated with the San Diego Formation, is questionably of Pliocene age, overlies the Capistrano Formation, and is overlain by Pleistocene gravels and alluvium. Outcrops of the San Mateo Formation were mapped by Woodford along the south side of Arroyo San Mateo near San Onofre in San Diego County, (pl. 24), on the east side of Aliso Creek 3 miles north of Dana Point in Orange County (pl. 35), and in a strip along the sea coast from south of San Juan Capistrano to the town of Oceanside.

Recently Frazier (1970) has reported the occurrence of sharks, fish, birds, sea lions, and whales in gravel quarries in the San Mateo Formation at Oceanside. The vertebrate fossils reported in the present paper were collected at the site Frazier reported and at other nearby localities in Lawrence Canyon and on both sides of San Luis Rey River northwest of Oceanside. These localities are at the extreme southern extent of Woodford's (1925, pl. 23) mapped outcrop of post-Capistrano Formation (San Mateo Formation and Pleistocene terrace) sediments.

Most of the localities are in gravel quarries and other man made exposures. Fossils have been collected as surface specimens that have been exposed by weathering. Bones and teeth are dis-associated and scattered through the sediment laterally and vertically. No quarries have ever been made for fossils because of the lack

of bonebeds, pockets, or other concentrations of bone.

At most of the Oceanside localities, well sorted, coarse, white quartz sand conformably overlies a reddish conglomerate that is coarsest at its base where granitic boulders are incorporated, and finer at the top. Fossil vertebrates are found in the white sand and in the red sand and finer gravel near the top of the conglomerate.

No invertebrate fossils have been found at the Oceanside outcrops of the San Mateo Formation. Several terrestrial mammal bones have been collected with marine vertebrates at the localities along the San Luis Rey River, to the north of the localities in Lawrence Canyon. The presence of large clasts and abraded bones, and absence of shells and well formed bedding in the deposit indicate a high energy environment of deposition. These factors, plus the occurrence of land mammal remains suggest a near shore environment, and the ancient shoreline may have been located a short distance northeast of the Oceanside fossil localities.

The known vertebrate fauna (see following list) differs from that of the San Diego Formation which is middle to late Pliocene in age. The differences in the two faunas indicate that the San Mateo Formation at Oceanside is older than the San Diego Formation exposed on San Diego Mesa. A tooth of Pliohippus sensu lato has been recovered from the San Mateo Formation and a tooth of Equus sensu lato has been recovered from the San Diego Formation.

Teeth of Isurus cf. I. hastalis have been recovered from the San Mateo Formation and not from the San Diego Formation. The species of shark occurs in California in deposits ranging in age

from middle Miocene to early Pliocene.

CAMP PENDLETON
SANTA MARGARITA
RIVER
LAS FLORES
RESERVATION
NAVAL
CAMP DEL MAR
Fallbrook Junc
Reservoir
Gravel Pit
Firebreak
Beacon
BOUNDARY
Lake
SAN
SANTA
Loretta St. (road)
V68145 older.
LACM 107029 whitesand
Bill 68106 Walker's Locality.
6-6880
8147 White Sand
107028-30, 31 32.
390000 FEET

Table 16 Preliminary Vertebrate Faunal List for the San Mateo Formation.

Taxa are indicated by X for occurrence at a UCMP vertebrate locality.

Taxon	V-6880	V-6881	V-68106	V-68144	V-68145	V-68146	V-68147	V-68148
Hexanchus sp.								X
Isurus cf. I. oxyrhynchus				X				
Isurus cf. I. hastalis		X		X	X			
Carcharodon cf. C. sulcidens	X	X	X		X		X	X
Isuridae					X			
Myliobatis sp.				X	X			
Teleostomi			X	X	X			
Salmonidae	X				X		X	
Scianidae				X				
Serranidae				X				
Aves	X		X	X	X		X	
aff. Phocoena					X			
Stenella cf. S. pliocenica			X					
Delphinidae			X	X	X			
Scaldicetus cf. S. grandis						X		
aff. Herpetocetus					X			
Balaenula sp.	X							
Arctocephalus sp.				X	X			
Otariinae, large	X		X	X	X			X
Odobenidae			X					
Pliohippus					X			
Artiodactyla					X			
Camelidae					X			
Hydrodamalis			X		X	X	X	X

Family Delphinidae

Subfamily Delphininae

Stenella Gray, 1866

Stenella cf. S. pliocenica Barnes

Referred specimen: UCMP 96504, right periotic, somewhat abraded with parts of the anterior and posterior processes missing.

Locality: UCMP V-68106, Lawrence Canyon Locality 3, Oceanside, San Diego County, California.

Collector: L. G. Barnes, 7 September 1968.

Osteology

Periotic.- The periotic closely resembles those of Stenella pliocenica (see San Diego Formation), from the San Diego Formation, in its small size, manner of elevation of the cerebral orifice of aquaeductus cochleae, and in the anterior extension of the border of the foramen centrale toward the anterior process. In overall shape of the periotic and positions of other foramina, it resembles Stenella pliocenica, and Recent Stenella, and Delphinus.

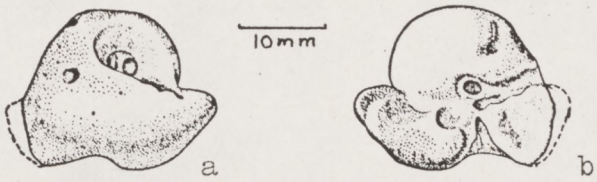

Fig. 96. Stenella sp., right periotic, UCMP 96504, locality V-68106 ; a, cerebral view; b, tympanic view. Scale line equals 10 mm.

Blancan age

Family Phocoenidae Bravard, 1885

aff. Phocoena Cuvier, 1817

more northerly locality probably Lower Level, but not certain

Referred specimen: UCMP 88657, left squamosal.

Locality: UCMP V-68145, Loretta Street Locality 2, Oceanside, San Diego County, California.

Collectors: UCMP personnel, August 1968.

Osteology

Squamosal.- Most of this bone is preserved, except for the vertical, lateral part forming the cranial wall. In the shape of the zygomatic arch, it resembles Recent phocoenids, and particularly Phocoena (harbor porpoises). It resembles Phocoena in size and by having an elongate zygomatic arch, rather deep laterally, upturned anteriorly, and bearing a posterior, external fossa. The bony lumen for the external acoustic meatus is deeper and more well defined than in Phocoena, and resembles Phocoenodelphis. There is a small anteroventral, rounded process for articulation with the jugal. As is typical of phocoenids, a broad, flat shelf joins the zygomatic arch to the cranium producing a broad fossa dorsally that floors the temporal fossa, and a flat surface ventrally occupied by an air sinus that does not overlie the glenoid articular surface. The squamosal may belong to a primitive form of Phocoena or may be referrable to ?Microphocaena californica, for which there is no known squamosal.

Family Physeteridae Gray, 1821

Scaldicetus Du Bus, 1867

Scaldicetus cf. S. grandis (Du Bus), 1872

Referred specimen: UCMP 88700, one tooth with an incomplete crown.

Locality: UCMP V-68146, Lawrence Canyon Locality 4, Oceanside, San Diego County, California.

Collector: J. Howard Hutchison, 17 October 1968.

Description

This tooth (UCMP 88700) agrees with teeth assigned to the fossil sperm whale Scaldicetus grandis (Du Bus), 1872, by Abel (1905, fig. 3, 4) and by Menesini and Tavani (1968, pl. 16, fig. 1, 2, and pl. 17) in posessing a large, curved, bulbous root with an encircling bulge between the middle and the crown, and a relatively small, conical crown covered with wrinkled enamel and set off from the root by a rather distinct neck. The fossil from Oceanside has the tip of the root broken off to expose a pulp cavity of small diameter. The enamel on the crown is not well preserved but is definitely finely wrinkled. Most of the crown has been worn away by an occluding tooth from the opposite jaw (whether upper or lower is not known) and the wear facet extends along the anterior side of the root to its widest point at the encircling bulge. Some of the teeth illustrated by Menesini and Tavani (1968) show similar wear facets.

Odontocetes with upper and lower teeth may develop wear facets

either on the anterior and posterior surfaces of tooth crowns when occlusion is alternating and interlocking or on labial sides of lower teeth and lingual sides of upper teeth when the latter overbite the former to the labial side. When wear facets are anterior and posterior from alternating interlocking occlusion as with UCMP 88700, it is difficult to determine whether an isolated tooth is an upper or lower tooth. When the upper teeth overbite the lower teeth to the labial side, wear facets on the labial or lingual sides of the crown may indicate whether an isolated tooth is a lower or upper.

Discussion

Menesini and Tavani (1968) summarized the generic names applied to Miocene sperm whales with teeth like the one from Oceanside, and concluded that the name Scaldicetus is a senior synonym of Palaeodelphis, Physodon, Hoplocetus, and Apenophyseter. Scaldicetus is therefore known from Miocene deposits of Italy, Patagonia, and Belgium, and Pliocene deposits of Italy, and now, California.

Teeth of Scaldicetus differ from those of Aulophyseter Kellogg, 1927, known from the middle Miocene Sharktooth Hill bonebed of California, which are smaller, and have a relatively larger crown with smoother enamel. The teeth of living sperm whales, Physeter catodon, have small crowns without enamel, and the species rarely has functional maxillary teeth. Scaldicetus is therefore more primitive than Physeter in posessing functional upper teeth (Abel, 1905, p. 66), a condition which may produce wear facets on all teeth when an interlocking, alternating type of occlusion exists. Such a type of occlusion must have produced the wear facets on the tooth from Oceanside (UCMP 88700).

?Family Cetotheriidae Cabrera, 1926

aff. Herpetocetus Van Beneden, 1872

Herpetocetus Van Beneden, 1872. Amn. Mus. Roy. d'Hist. Nat. Belgique.

Referred specimen: UCMP 88667, posterior end of left dentary.

Locality: UCMP V-68145, Loretta Street Locality 2, Oceanside, San Diego County, California. level ? probably lower

Collectors: University of California personnel, 1 August 1968.

Osteology

Mandible.- The fragment of dentary (UCMP 88667) bears the condyloid process and angular process. The specimen shows in common with Herpetocetus scaldisensis Van Beneden of late Miocene age from Belgium, small size, posteriorly extended angular process, and anterodorsally sloping condyloid articular surface. Specimens figured by Van Beneden (18_ : pls. 103, 104) have a longer angular process and condyloid process broader dorsally than does the specimen from Oceanside, which has a deeper medial groove separating the two processes. The animal from Oceanside therefore represents a slightly more primitive condition, and maybe allied with Herpetocetus. It may actually be considered an intermediate stage between a typical cetotheriid (like Amphicetus) and the more advanced mysticete Herpetocetus.

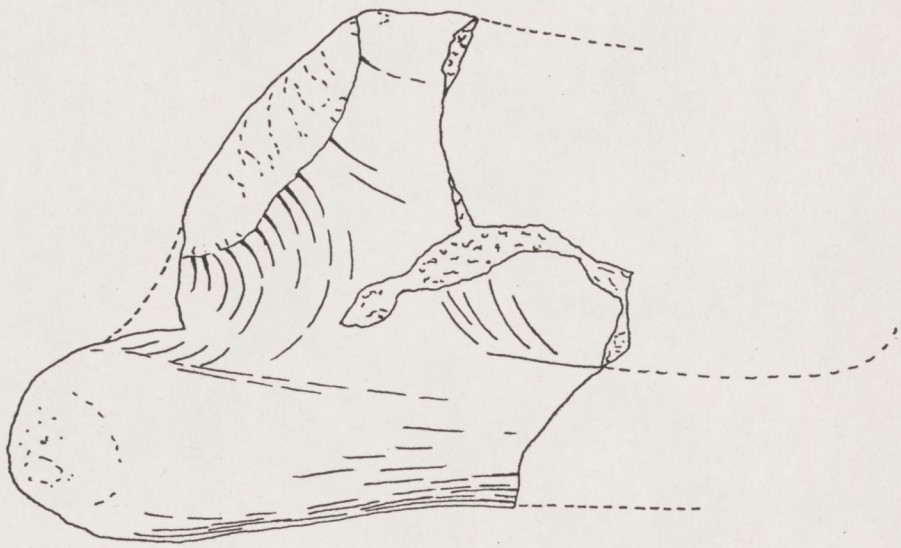

Fig. 93. aff. Herpetocetus Van Beneden, posterior end of left dentary, UCMP 88667, locality V-68145; medial view. Natural size.

Family Balaenidae Gray, 1825

Balaenula sp.

Referred specimen: UCMP 83223, incomplete cranium lacking anterior end, occipital condyles, and parts of the zygomatic arches.

Locality: UCMP V-6880, Lawrence Canyon Locality 1, Oceanside, San Diego County, California.

Collectors: Lester Kent and J. Howard Hutchison, 18 August 1968.

Osteology

Skull.- Although this cranial section is poorly preserved, it shows features in common with primitive bowhead or right whales, and closely resembles a skull from the Merced Formation identified as Balaenula sp. nov. Because the specimen from the Merced Formation allows a detailed description, the fragmentary skull from Oceanside will be briefly described. It agrees with Balaenula by having the occipital shield broad posteriorly, and narrow anteriorly, the glenoid fossae of the squamosal located on descending columns, large, ventrally descending falcate processes of the basioccipitals, rather highly arched visceral area below the basioccipital, no distinct foramen ovale, relatively broad ventral surface of the squamosal between the glenoid fossa and the auditory capsule with a sharp anterior margin, and vertical lateral wall of the cranium with a deep, rounded crease at the posterodorsal angle of the supraorbital process. The specimen is slightly smaller than the one from the Merced Formation, and had an estimated zygomatic width of 82 cm and an estimated exoccipital width of 56 cm. In contrast with the specimen from the Merced Formation, the paroccipital processes are thinner, the bony lumen of the external auditory meatus is shallower, and the zygomatic arch of the squamosal is not as heavy. The anterior surface of the basioccipital is visible at the basioccipital-basisphenoid suture, and is very thick (7 cm thick dorsoventrally).

CAMP PENDLETON
MARINE CORPS BASE
CORPS BASE
SANTA MARGARITA
Margarita
Santa
Santa Margarita Sch
Gaging Station
Reservoir
Tuley
Wire Mountain
SANTA MARGARITA
Hubbert Lake
Water Tank
NAVAL RESERVATION
Del Mar
Fallbrook Junction
Fire Sta.
FREEWAY
North Terrace Sch
PO.
SAN SIMEON ST
SAN JUAN ST
Gas Station
Capistrano Park
San Luis Rey River
SANTA FE
Trailer Park
Oceanside Harbor
Parking
Light
Wh. Sand
2811
2957
3003
3004
3123
3134
Gravel
2643
3004
2957
2643 (3003)
2811
3134
2643
2811
3003 + 3123
Misc. White Sand
OCEANSIDE
(BM 47)
Pier
Fire Sta
Trailer Park
North Oceanside Sch
Hosp
High Sch
Oceanside-Carlsbad Country Club
Eastside Park
Laurel Sch
Jefferson Jr High Sch
Mission Sch
Shopping Center
Firing Range
Oceanside
San Luis Rey
SAN LUIS REY DR
RIVERSIDE
WALTON
LORETTA
LANGFORD
GUADALCANAL
HOLLY
BUSH
MISSION
MAXSON
SAN DIEGO
CLEVELAND
HILL
CLEMENTINE
GRANT
MESA
BARNWELL
MC DONALD
HOOVER
BUTLER
CROUCH
PARK
Well
BM 25
BM 17
Tuley
Water Tank
Well
Res
Res
Res
Res

Age relationships of various Cretaceous-Tertiary formations according to Barnes PhD thesis 1972

——— Merced
——— San Diego
——— San Mateo
——— Purisima
——— Almejas
——— Drakes Bay
——— Capistrano
——— Sta Margarita

Blancan	"San Joaquin"	Wheelerian
Hemphillian	"Etchegoin"	Venturian
	"Jacalitos"	Repettian
		Delmontian
	"Neroly"	
Clarendonian	Cierbo"	Mohnian
	Buenos	Luisian
Barstovian	Temblor	Relizian
		Saucesian
Hemingfordian		

Barnes - in Systematic Zool.

Latest Mioc - Earliest Plio.

correlate with Lacalitas + Etchegoin fms. of San Joaquin

- Brakes Bay fm. - no. of San Francisco
- Purisima - central Calif. coast
- Capistrano fm - Orange Co
- San Mateo fm - S. Diego Co.
- Altamesta fm. - Baja Calif.

also Hemphillian
Late Delmontian
Repettian +
Venturian forams. 10 - 5 my BP

Mid & late Plio.

- Merced - Cent. Calif.
- Niguel fm Orange Co.
- Late part of Capistrano
- San Diego fm - San Diego + NW Mex.